4.6 GEOLOGY AND SOILS

This section describes the geologic and soil conditions at the project site and its vicinity and evaluates the potential of the proposed project to result in new or exacerbate existing impacts related to these conditions. The environmental setting section describes the geologic environment of the proposed project based on geologic reports and maps prepared by the United States Geological Survey (USGS) and California Geological Survey (CGS); Solano County General Plan maps; and the site-specific *Geotechnical Engineering Report* (Geotechnical Report) prepared by Wallace Kuhl & Associates for the proposed project[1] and provided in **Appendix G** of this EIR. This section assesses potential impacts related to geologic and seismic hazards, including impacts from strong ground shaking, liquefaction, slope failure, lateral slope deformation, differentiated settlement, unstable or expansive soils, and paleontological resources.

4.6.1 Environmental Setting

This section describes the existing geologic and seismic conditions of the proposed project, the vicinity, and associated hazards. It also presents the paleontological setting of the project site.

4.6.1.1 Geologic Conditions

The geology, topography, and soils of the project site and vicinity are described below.

Geology. The project site is located in Green Valley, one of numerous valleys in the Coast Ranges geomorphic province of Northern California. The Coast Ranges geomorphic province parallels the California coastline from the California/Oregon border down to Santa Barbara and generally consists of northwest-trending mountain ranges and hills formed by folding and faulting and separated by narrow valleys. The northwest trending folds and faults run subparallel to the San Andreas fault and were created as a result of complex tectonic processes involving colliding plate boundaries and subsequent transitional shear along the San Andreas fault system.

The Coast Ranges are composed of thick Mesozoic and Cenozoic sedimentary strata. The northern and southern ranges are separated by a depression containing the San Francisco Bay. The northern Coast Ranges are dominated by irregular, knobby, landslide-topography of the Franciscan Complex. The eastern border is characterized by strike-ridges and valleys in Upper Mesozoic strata.[2]

Topography. The project site is generally level with elevations ranging from 15 to 20 feet above mean sea level (msl) with two areas that contain rough graded building pads that are slightly

[1] Wallace Kuhl & Associates. 2021. *Geotechnical Engineering Report. Green Valley 3 Apartments*. May 4 (Revised February 16, 2022).

[2] California Geological Survey. 2002. Note 36, California Geomorphic Provinces.

elevated above the rest of the site at 19 to 20 feet above msl.[3] The site slopes gently towards the south.

Based on borings conducted in 2021 as part of the geotechnical evaluation of the project site, groundwater was observed at depths ranging from 6 to 8 feet below existing grades.[4]

Soils. According to the *City of Fairfield General Plan EIR*, soils in the lower Green Valley region are nearly level to gently sloping, well drained, and belong to the following soil associations: Yolo-Brentwood-Sycamore Association, Rincon-Yolo Association, and Capay-Clearlake Association.[5]

The project site soils include Clear Lake clay with 0 to 2 percent slopes and Yolo loam.[6] According to the Geotechnical Report, the surface and near-surface soils up to a depth of about 2 feet are characterized as soft to stiff, high plasticity, clays with varying amounts of sand. These are underlain by stiff to hard, moderate plasticity clay with variable amounts of silt and sand.[7]

4.6.1.2 Seismic Conditions

The entire San Francisco Bay Area (Bay Area) is located within the San Andreas Fault Zone, a complex of active faults (i.e., faults with evidence of rupture in the past 11,000 years). Numerous historic earthquakes have been generated in northern California by the San Andreas Fault Zone. This level of active seismicity results in relatively high seismic risk throughout the Bay Area.

There are several active faults within a 25-mile radius of the project site. As shown in **Figure 4.6-1: Regional Faults**, the Cordelia fault is located less than 0.25 mile east of the project site, and the Green Valley fault is less than 1 mile west of the project site. The other notable active faults include the West Napa fault about 5 to 10 miles west of the site, the Rodgers Creek fault about 20 miles west of the site, the Hayward fault about 20 miles to the southwest, and the Greenville fault about 20 miles to the south-southeast.[8]

As noted in the *City of Fairfield General Plan* Health and Safety Element, "Most large earthquakes in the Bay Area have occurred along the major faults, including the San Andreas, Hayward, and Calaveras faults, which are located 20 to 45 miles west and south of Fairfield. The largest recorded earthquake in the Fairfield area occurred on April 19, 1892, with a large aftershock on April 21, 1892 with an estimated magnitude range of 6.0 to 6.5."

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3 Wallace Kuhl & Associates. *Geotechnical Engineering Report. Green Valley 3 Apartments*. May 4, 2021 (Revised February 16, 2022)

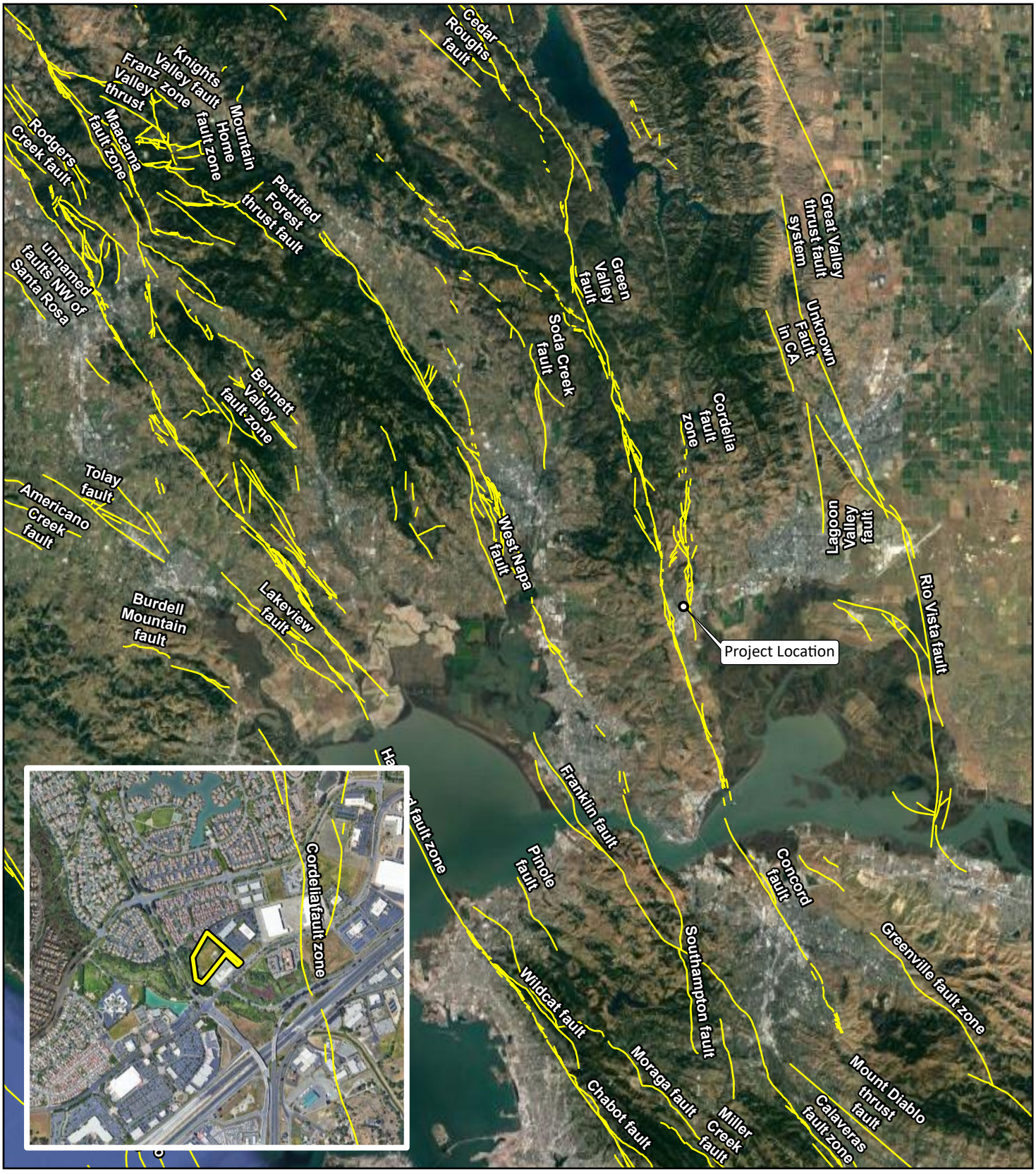
4 Ibid.

5 Jones & Stokes, *Draft Program Environmental Impact Report Comprehensive Amendment to the City of Fairfield General Plan*, Chapter 7 Health and Safety, Figure 7-1 Soil Associations of the Planning Area, August 2001.

6 United States Department of Agriculture Natural Resources Conservation Service, WebSoil Survey. Website: https://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm (accessed May 4, 2022).

7 Wallace Kuhl & Associates. *Geotechnical Engineering Report. Green Valley 3 Apartments*. May 4, 2021 (Revised February 16, 2022)

8 Ibid.



LEGEND

- Project Site
- Project Site
- Quaternary Faults

FIGURE 4.6-1

0 3.5 7
MILES

Green Valley 3 Apartments Project

Regional Faults

Source: Google (2021); CGS (2021)

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USGS monitors and studies seismic activity in California. Using information from recent earthquakes, improved mapping of active faults, more accurate measurements of current plate motions and stress on individual faults, and a new model for estimating earthquake probabilities, the 2014 Working Group on California Earthquakes Probabilities (Working Group) at the USGS updated the 30-year forecast for California in 2016. The Working Group concluded that there was a 72 percent probability of at least one earthquake of magnitude 6.7 or greater affecting the Bay Area before 2043. The probability of a large earthquake on an individual fault in the Bay Area is lower than the probability of a large earthquake anywhere in the region. The faults with the highest probability of experiencing large earthquakes are Hayward, Rodger Creek, Calaveras, and San Andreas faults. The Working Group estimates that the probability of a large earthquake on Green Valley-Concord fault system is about 16 percent.[9]

4.6.1.3 Seismic and Geologic Hazards

Seismic and geologic hazards include surface rupture, ground shaking, liquefaction and lateral spreading, expansive soils, slope instability, and settlement and differential settlement. Each of these potential hazards is discussed below.

Surface Rupture. Surface rupture occurs when the ground surface is broken due to fault movement during an earthquake. Surface rupture generally occurs along an existing (usually active) fault trace. Pursuant to the Alquist-Priolo Earthquake Fault Zoning Act, the CGS has established Alquist-Priolo earthquake fault zones which are regulatory zones surrounding the surface traces of active faults in California. A trace is a line on the earth's surface defining a fault; an active fault is defined as a fault that has ruptured within the last 11,000 years. These zones delineate areas along active faults that are considered to be susceptible to surface fault rupture during an earthquake on the fault.

The nearest Alquist-Priolo Fault Study Zone to the project site is the zone established for the Cordelia fault. This fault study zone is about 700 feet east of the project site (**Figure 4.6-1**). The project site is not within the delineated fault study zones for the Cordelia or the Green Valley faults.[10]

Ground Shaking. Seismic ground shaking generally refers to all aspects of motion of the earth's surface resulting from an earthquake and is normally the major cause of damage in seismic events. The extent of ground shaking is determined by the magnitude and intensity of the earthquake, distance from the epicenter, local geologic, soil, and groundwater conditions. The magnitude of a seismic event is a measure of the energy released by an earthquake; it is assessed by seismographs that measure the amplitude of seismic waves. The intensity of an earthquake is a subjective measure of the perceptible effects of a seismic event at a given point.

9 U.S. Geological Survey. Earthquake Outlook for the San Francisco Bay Region 2014-2043. Fact Sheet 2016-3020. Revised August 2016.

10 Wallace Kuhl & Associates. *Geotechnical Engineering Report. Green Valley 3 Apartments*. May 4, 2021 (Revised February 16, 2022)

Due to the proximity of several active faults, soils present on the project site and high groundwater elevations, there is a high potential for the site to experience severe ground shaking from future earthquakes on the regional faults.

Liquefaction. Liquefaction is the temporary transformation of loose, saturated granular sediments from a solid state to a liquefied state as a result of seismic ground shaking. In the process, the soil undergoes transient loss of strength, which commonly causes ground displacement or ground failure to occur. Since saturated soils are a necessary condition for liquefaction, soil layers in areas where the groundwater table is near the surface have higher liquefaction potential than those in which the water table is located at greater depths.

According to the Solano County General Plan, the Green Valley area in general is characterized by a moderate potential for liquefaction. However, the liquefaction analysis included in the site-specific Geotechnical Report conducted for the proposed project, which was based on the site's vertical soil profile and groundwater levels, shows that the risk of liquefaction at the site from the design seismic event (magnitude 6.7 earthquake and mean peak ground acceleration of 0.60g) is low.[11]

Lateral Spreading. Lateral spreading is lateral ground movement, with some vertical component, caused by liquefaction. In a lateral spread failure, a layer of ground at the surface is carried on an underlying layer of liquefied material over a nearly flat surface toward a river channel or other bank. The lateral spreading hazard tends to mirror the liquefaction hazard for a site.

As the potential for liquefaction is low, the potential for lateral spreading on the project site is also considered low.

Expansive Soils. Expansive soils are characterized by the potential for shrinking and swelling as the moisture content of the soil decreases and increases, respectively. Shrink-swell potential is influenced by the amount and type of clay minerals present and can be measured by the percent change of the soil volume. As a consequence of such volume changes, structural damage to buildings and infrastructure can occur if potentially expansive soils are not considered in project design and during construction.

The Geotechnical Report indicates that the surface and near-surface soils on the project site are highly expansive and are likely to shrink and swell substantially based on fluctuating moisture content.[12]

Slope Stability. Slope failure can occur as either rapid movement of large masses of soil (landslide) or slow, continuous movement (creep) on slopes of varying steepness.

[11] Wallace Kuhl & Associates. *Geotechnical Engineering Report. Green Valley 3 Apartments*. May 4, 2021 (Revised February 16, 2022).

[12] Ibid.

The project site is located in a portion of Green Valley that is not susceptible to landslides or soil creep. The project site is not located within a landslide hazard zone as designated on a map prepared by the CGS.[13]

Settlement and Differential Settlement. Settlement is the lowering of the land-surface elevation as a result of loading (i.e., placing heavy loads, typically fill or structures), which often occurs with the development of a site. Settlement or differential (e.g., unequal) settlement could occur if buildings or other improvements are built on low-strength foundation materials (including imported non-engineered fill) or if improvements straddle the boundary between different types of subsurface materials (e.g., a boundary between native material and fill). Although settlement generally occurs slowly enough that its effects are not dangerous to inhabitants, it can cause significant building damage over time.

According to the Geotechnical Report, the upper 1 to 2 feet of soils on the project site are in a soft condition due to the seasonal wetting and drying over the years. Settlement could occur if heavy loads are placed directly on these soils.[14]

4.6.1.4 Paleontological Setting

Paleontological resources, with a few rare exceptions, occur only in sedimentary deposit formations or deposits. The geologic formations underlying the project site is Quaternary alluvium and marine deposits (CAQ) from the Pleistocene to Holocene period in California's geologic history. Because of their young age, these geologic formations are assigned low paleontological resource sensitivity. Furthermore, the University of California Berkeley UC Museum of Paleontology[15] website was reviewed, and the available data identified 1,698 paleontological resources that have been collected in Solano County. None of these resources were located on or in the vicinity of the project site.

4.6.2 Regulatory Setting

Federal, State, and local regulations related to geology, seismicity, soils and building safety that are applicable to the project site are described below.

4.6.2.1 Federal Laws and Regulations

Federal National Earthquake Hazards Reduction Program. The National Earthquake Hazards Reduction Program (NEHRP) was established by the U.S. Congress when it passed the Earthquake Hazards Reduction Act of 1977, Public Law (PL) 95–124. In establishing NEHRP, Congress recognized that earthquake-related losses could be reduced through improved design and construction methods and practices, land use controls and redevelopment, prediction techniques and early-

13 California Department of Conservation, California Geological Survey, Landslide Inventory. Website: https://maps.conservation.ca.gov/cgs/lsi/app/ (accessed February 16, 2022).

14 Wallace Kuhl & Associates. *Geotechnical Engineering Report. Green Valley 3 Apartments*. May 4, 2021 (Revised February 16, 2022).

15 University of California Berkeley UC Museum of Paleontology. Website: https://ucmp.berkeley.edu/ (accessed May 2022).

warning systems, coordinated emergency preparedness plans, and public education and involvement programs. The four basic NEHRP goals are:

- Develop effective practices and policies for earthquake loss reduction and accelerate their implementation.
- Improve techniques for reducing earthquake vulnerabilities of facilities and systems.
- Improve earthquake hazards identification and risk assessment methods, and their use.
- Improve the understanding of earthquakes and their effects.
- Implementation of NEHRP priorities is accomplished primarily through original research, publications, and recommendations to assist and guide State, regional, and local agencies in the development of plans and policies to promote safety and emergency planning.

4.6.2.2 State Laws and Regulations

California Alquist-Priolo Earthquake Fault Zoning Act. The California Alquist-Priolo Earthquake Fault Zoning Act (AP Act) was passed in 1972, and its main purpose is to prevent the construction of buildings used for human occupancy on the surface trace of active earthquake faults. The AP Act requires the State Geologist to establish regulatory zones (known as Earthquake Fault Zones) around the surface traces of active faults and to issue appropriate maps. "Earthquake Fault Zones" were called "Special Studies Zones" prior to January 1, 1994. The maps are distributed to all affected cities, counties, and state agencies for their use in planning and controlling new or renewed construction. Local agencies must regulate most development projects within the zones. The AP Act only addresses the hazard of surface fault rupture and is not directed toward other earthquake hazards. Surface rupture is the most easily avoided seismic hazard. As discussed below, the California Seismic Hazards Mapping Act (SHMA), passed in 1990, addresses non-surface fault rupture earthquake hazards, including liquefaction and seismically induced landslides.

California Building Standards Code. The California Building Code (CBC), which refers to Part 2 of the California Building Standards Code in Title 24 of the California Code of Regulations, is based on the International Building Code. The CBC is updated every 3 years, and the current 2019 CBC went into effect on January 1, 2020. The 2022 CBC, which the proposed project would be subject to, will go into effect on January 1, 2023. The CBC covers grading and other geotechnical issues, building specifications, and non-building structures. The CBC requires that a site-specific geotechnical investigation report be prepared by a licensed professional for proposed developments of one or more buildings greater than 4,000 square feet to evaluate geologic and seismic hazards. Buildings less than or equal to 4,000 square feet also require preparation of a geologic engineering report, except for one-story, wood-frame and light-steel-frame buildings of Type V construction that are located outside of the Alquist-Priolo Earthquake Fault Zones.

The purpose of a site-specific geotechnical investigation is to identify seismic and geologic conditions that require project mitigation, such as surface fault rupture, ground shaking, liquefaction, differential settlement, lateral spreading, expansive soils, and slope stability. Requirements for the

geotechnical investigation are presented in Chapter 16 "Structural Design" and Chapter 18 "Soils and Foundation" of the CBC.

California Seismic Hazards Mapping Act (SHMA). The SHMA of 1990 (Public Resources Code, Sections 2690- 2699.6) directs the Department of Conservation, California Geological Survey (CGS) to identify and map areas prone to liquefaction, earthquake-induced landslides, and amplified ground shaking. The purpose of the SHMA is to minimize loss of life and property through the identification, evaluation, and mitigation of seismic hazards. The SHMA was passed by the legislature following the 1989 Loma Prieta earthquake. Staff geologists in the Seismic Hazard Zonation Program gather existing geological, geophysical, and geotechnical data from numerous sources to produce the Seismic Hazard Zone Maps. They integrate and interpret these data regionally in order to evaluate the severity of the seismic hazards and designate as Zones of Required Investigation (ZORI) those areas prone to liquefaction and earthquake–induced landslides. Cities and counties are then required to use the Seismic Hazard Zone Maps in their land use planning and building permit processes. The Seismic Hazards Mapping Act requires site-specific geotechnical investigations be conducted within ZORI areas to identify and evaluate seismic hazards and formulate mitigation measures prior to permitting most developments designed for human occupancy.

4.6.2.3 Local Plans and Regulations

***City of Fairfield General Plan*.** The following objectives and policies of the *City of Fairfield General Plan* Health and Safety Element pertaining to geology and soils would be applicable to the proposed project:

> **Policy HS 1.2:** All new buildings, structures, and walls shall conform to the latest seismic and geologic safety structural standards of the California Building Code as a minimum standard.
>
> **Policy HS 1.4:** Require detailed geologic studies by a Registered Geologist (RG), Certified Engineering Geologist (CEG), and/or Geotechnical Engineer for projects within areas of potential seismic activity. All studies prepared shall identify the location of all surface fault traces within 100 feet of any proposed structure and determine their relative activity. Adequate provisions for mitigation of potential hazards to human life or property shall also be included.
>
> **Policy HS 1.9:** The City should retain a Registered Geologist, Certified Engineering Geologist and/or Geotechnical Engineer to evaluate geologic reports required where seismic conditions warrant special attention. The cost of such services shall be borne by the applicant.
>
> **Policy HS 2.4:** Development is discouraged on slopes in excess of twenty (20) percent and/or unstable soils.
>
> **Policy HS 2.5:** Require strict engineering standards for construction on soils subject to significant shrink/swell and areas of high ground failure potential.

Policy HS 2.6: Require strict engineering standards for development projects located in identified landslide prone areas.

Policy HS 2.7: Require a detailed geotechnical report, including borings, for projects involving construction on soils and substrate subject to potential liquefaction, and implement the recommendations of the report by making them condition of project approval.

Policy HS 2.8: Require an erosion control and rehabilitation plan to be prepared for projects requiring substantial groundbreaking activities to control short-term and long-term erosion and sedimentation in nearby streams and rivers.

4.6.3 Significance Criteria

The significance criteria for the evaluation of geology and soils impacts used in this analysis are consistent with Appendix G of the *State CEQA Guidelines*. The proposed project may be deemed to have a significant impact with respect to geology and soils if it would:

- **Directly or indirectly cause potential substantial adverse effects, including the risk of loss, injury, or death involving:**
    - **Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault. (Refer to Division of Mines and Geology Special Publication 42.)**
    - **Strong seismic ground shaking.**
    - **Seismic-related ground failure, including liquefaction.**
    - **Landslides.**
- **Result in substantial soil erosion or the loss of topsoil.**
- **Be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction, or collapse.**
- **Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial direct or indirect risks to life and property.**
- **Have soils incapable of adequately supporting the use of septic tanks or alternative wastewater disposal systems where sewers are not available for the disposal of wastewater.**
- **Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature.**

4.6.4 Methodology

The following resources were reviewed to assess the potential for impacts associated with site geologic conditions.

- Project-specific Geotechnical Report
- Regional and State information related to geologic, seismic, and soils conditions prepared by the USGS and CGS
- Relevant State regulations and local policies

The analysis compares identified impacts to significance criteria listed above and determines the impact's level of significance under CEQA. If the impact is determined to be significant, the analysis identifies feasible mitigation measures to eliminate the impact or reduce it to a less-than-significant level. The project's potential contribution to cumulative impacts is also identified.

The California Supreme Court concluded in its *California Building Industry Association v. Bay Area Air Quality Management District* (CBIA v. BAAQMD) decision that "CEQA generally does not require an analysis of how existing environmental conditions will affect a project's future users or residents." With this ruling, CEQA no longer considers the impact of the environment on a project (such as the impact of existing seismic hazards on new project occupants) to be an environmental impact, unless the project could exacerbate an existing environmental hazard. The proposed project would not change existing seismic hazards and, therefore, would not exacerbate existing hazards related to surface fault rupture and seismic ground shaking. As such, the following discussions of seismic hazards identified in **Impact GEO-1** are provided for informational purposes only.

4.6.5 Project Impacts

The following section discusses potential geology and soils impacts associated with implementation of the proposed project. As applicable, conditions of approval and mitigation measures are presented to reduce potential impacts.

4.6.5.1 Rupture of a Known Earthquake Fault, Strong Seismic Ground Shaking, Seismic-Related Ground Failure, and Landslides

Impact GEO-1: The proposed project would not, directly or indirectly, cause potential substantial adverse effects, including the risk of loss, injury, or death involving rupture of a known earthquake fault; strong seismic ground shaking; seismic-related ground failure, including liquefaction; or landslides.

As discussed in **Section 4.6.1.3** above, the project site is not located within an Alquist-Priolo Fault Zone and there are no known active, potentially active, or inactive faults that transect the project site. The nearest Alquist-Priolo Fault Zone associated with the Cordelia fault is at least 700 feet from the project site. The potential for fault rupture at the project site is considered to be low and there would be no impact related to fault rupture.

Similar to all areas within the Bay Area, the project site is likely to experience moderate to strong ground shaking in the event of a major earthquake on any of the Bay Area faults. As noted **in Section 4.6.1.3** above, according to the Working Group at CGS, there is a 72 percent probability of a major earthquake (magnitude 6.7 or greater) to occur between now and 2043 on one of the Bay Area major faults. The probability of a major earthquake on the Green Valley-Concord fault system is estimated at 16 percent by the Working Group.

Strong ground shaking caused by large earthquakes can induce ground failures, such as liquefaction, lateral spreading, and landslides. Based on the Geotechnical Report prepared for the project, the risk of liquefaction was calculated to be very low based on ground shaking associated with a design earthquake with a magnitude of 6.7 and a resulting mean peak ground acceleration of 0.60g at the project site. As the potential for liquefaction to occur at the site is low, the potential for ground failures associated with liquefaction (i.e., post-liquefaction reconsolidation, loss of bearing support, seismically induced settlement, and lateral spreading) is also low. As noted in **Section 4.6.1.3** above, the project site is not in an area that would be subject to earthquake-induced or other landslides.

In summary, although strong ground shaking due to a major earthquake in the Bay Area would occur on the project site, the potential for substantial damage to the proposed apartment complex would be minimized as the proposed project would be constructed in compliance with the current CBC and policies contained in the Health and Safety Element of the *City of Fairfield General Plan*. The City's Building Division is responsible for reviewing plans, issuing building permits, and conducting field inspections. The design of the project would be required to conform to the current CBC at the time of plan review. Compliance with the 2022 CBC, which will be in effect in 2023 when a building permit is issued by the City, would ensure that the project would be designed and constructed in accordance with the geotechnical recommendations to account for and withstand seismic and geologic hazards that could have adverse effects on the project. Therefore, impacts associated with seismic hazard conditions at the site would not be exacerbated and project occupants and structures would not be exposed to substantial risk of loss, injury, or death during a large regional earthquake. It is acknowledged that seismic hazards cannot be completely eliminated, even with site-specific geotechnical investigation/design and advanced building practices. However, the seismic design standards of the 2022 CBC are intended to prevent catastrophic building failure in the most severe earthquakes currently anticipated. Therefore, the project would not cause, directly or indirectly, adverse effects involving risk of damage, loss or injury due to seismic-related hazards. The impact would be less than significant.

Level of Significance Prior to Mitigation: Less than Significant

Mitigation Measures: No mitigation measures are required.

Level of Significance after Mitigation: Not Applicable

4.6.5.2 Soil Erosion and Loss of Topsoil

Impact GEO-2: The proposed project would not result in substantial soil erosion or the loss of topsoil.

The approximately 5.78-acre project site consists of a currently undeveloped, generally level parcel (ground elevations range between 15 and 20 feet above mean sea level) with a slight slope from north to southwest. The surface soils at the project site are clayey and are expected to have a low to moderate erosion potential.[16]

Construction of the proposed project would require grading and earthwork leaving bare earth that could result in soil erosion and loss of topsoil on the project site. During operation of the proposed project, the project site would be covered with a residential building, surface parking areas, a two-story parking garage, and internal circulation system, and landscaping, which would minimize post-development erosion. The project would also comply with the *City of Fairfield General Plan* Health and Safety Element Policy HS 2.8 which requires projects involving substantial groundbreaking activities to prepare an erosion control and rehabilitation plan to control short-term and long-term erosion and sedimentation in nearby streams and rivers. Furthermore, as discussed in **Impact HYD-1** in **Section 4.8: Hydrology and Water Quality**, of this EIR, the construction contractor would be required to prepare a Storm Water Pollution Prevention Plan (SWPPP) in accordance with the National Pollution Discharge Elimination System (NPDES). The SWPPP is required to be prepared by a Qualified Storm Water Pollution Prevention Plan Developer (QSD) and include both construction-phase erosion control measures and permanent erosion control measures for the proposed project per the requirements of the State Water Resources Control Board (SWRCB) adopted in accordance with the General Construction Activity Storm Water Permit. As the proposed project would develop and implement a SWPPP in compliance with the Construction General Permit and *Fairfield Municipal Code*, the impact related to erosion and loss of topsoil would be less than significant.

Level of Significance Prior to Mitigation: Less than Significant

Mitigation Measures: No mitigation measures are required.

Level of Significance after Mitigation: Not Applicable

[16] United States Department of Agriculture, Natural Resources Conservation Service, WebSoil Survey Website: https://websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey.aspx (accessed May 5, 2022). Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Values of K range from 0.02 to 0.69. Clear Lake clay, 0 to 2 percent slopes has a K factor rating of 0.17 and Yolo loam, clay substratum has a K factor rating of 0.43; therefore, these soils have a low to moderate erosion potential.

4.6.5.3 Unstable Geologic Unit or Soils

Impact GEO-3: The project could be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction, or collapse.

As discussed under **Impacts GEO-1** and **GEO-2** above, the project site is relatively level, with elevations ranging between 15 to 20 feet above msl. Areas around the project site are also relatively level; therefore, neither the project site nor adjacent land are subject to landslides or other slope stability hazards. Furthermore, the project site is not located within a landslide hazard zone as designated on a map prepared by the California Geological Survey (CGS).[17]

As discussed in **Section 4.6.1.3**, according to the Geotechnical Report, the upper 1 to 2 feet of soils on the project site are in a relatively soft condition due to the seasonal wetting and drying over the years. Differential settlement could occur if heavy loads were placed directly on these soils. In the area of the proposed parking structure, soils up to a depth of 40 feet are not suitable for the loads associated with the parking structure and differential settlement under the structure could occur. To address these conditions, the Geotechnical Report recommends that the upper 1 to 2 feet of soils be removed in the portions of the site that would support the apartment building and replaced with engineered fill. Similarly, the report includes recommendations to either construct the parking structure on piers that are installed in competent soils, or a subgrade consisting of a compacted, aggregate pier system be installed which would also be stable under static conditions and not result in differential settlement at the garage structure site. The proposed project's compliance with the CBC and policies contained in the Health and Safety Element of the *City of Fairfield General Plan* and implementation of **Mitigation Measure GEO-1**, which includes incorporation of the recommendations of the Geotechnical Report into project design and construction, would reduce the impact related to hazards due to differential settlement to less than significant.

Level of Significance Prior to Mitigation: Potentially Significant

Mitigation Measures: The following mitigation measure will be implemented to reduce impacts related to hazards due to differential settlement.

MM GEO-1 Prior to the issuance of any site-specific grading or building permits, the City's Building Division shall confirm that project plans have incorporated geotechnical recommendations included in the February 16, 2022 (or most current version) *Geotechnical Engineering Report* prepared by Wallace Kuhl & Associates and the project's geotechnical engineer has reviewed and approved project plans. Prior to the issuance of building occupancy permits, the City's Building Division shall ensure that implementation of all the geotechnical recommendations, including design criteria, specifications, and construction observations/inspection/testing, has been

[17] California Department of Conservation, California Geological Survey (CGS). Landslide Inventory. Website: https://maps.conservation.ca.gov/cgs/lsi/app/ (accessed February 16, 2022).

performed and documented in a construction completion report prepared by the project's geotechnical engineer.

Level of Significance after Mitigation: Less than Significant

4.6.5.4 Expansive Soils

Impact GEO-4: The proposed project would be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial direct or indirect risks to life and property.

Based on an analysis of project site soils, the Geotechnical Report concluded that the surface and near-surface soils on the project site are highly expansive and are likely to shrink and swell substantially based on fluctuating moisture content. These soils are considered to have the potential to cause substantial vertical movements of shallow conventional foundations, interior floor slabs, exterior flatwork, and pavements.[18] To minimize the potential for these expansive soils to affect the proposed project, the Geotechnical Report recommends either the expansive soils be removed and replaced with imported, compactable, low-expansive soils or the site soils under the proposed structures and pavements be amended with lime treatment to reduce their shrink swell potential. The proposed project's compliance with the CBC and policies contained in the Health and Safety Element of the *City of Fairfield General Plan* and implementation of **Mitigation Measure GEO-1** (set forth above), which includes incorporation of the recommendations of the Geotechnical Report into project design and construction, would reduce the impact related to expansive soils to less than significant.

Level of Significance Prior to Mitigation: Potentially Significant

Mitigation Measures: Implement **Mitigation Measure GEO-1**.

Level of Significance after Mitigation: Less than Significant

4.6.5.5 Alternative Wastewater Disposal Systems

Impact GEO-5: The proposed project would not involve soils incapable of adequately supporting the use of septic tanks or alternative wastewater disposal systems where sewers are not available for the disposal of wastewater.

The proposed project would connect to the existing wastewater infrastructure within the vicinity of the project site and would not involve the use of septic tanks or alternative wastewater disposal systems. Therefore, no impact would occur.

Level of Significance Prior to Mitigation: No Impact

[18] Wallace Kuhl & Associates. *Geotechnical Engineering Report. Green Valley 3 Apartments*. May 4, 2021 (Revised February 16, 2022)

Mitigation Measures: No mitigation measures are required.

Level of Significance after Mitigation: Not Applicable

4.6.5.6 Paleontological Resources

Impact GEO-6: The project would not directly or indirectly affect a unique geological feature but could inadvertently destroy a unique paleontological resource or site.

The University of California Berkeley UC Museum of Paleontology website was reviewed, and the available data identified 1,698 paleontological resources that have been collected in Solano County.[19] None of these resources were located on or in the vicinity of the project site.

The geologic formation underlying the project site is Quaternary alluvium and marine deposits (CAQ) from the Pleistocene to Holocene period in California's geologic history.[20] Because of their young age, CAQ geologic formations are assigned low paleontological resource sensitivity. Therefore, the potential to uncover unknown paleontological resources on the project site during construction is low. However, although the probability of uncovering paleontological resources on the project site is low, some potential still exists. Therefore, **Mitigation Measure GEO-2** is set forth below which would ensure proper collection and treatment of paleontological resources, should they be discovered during project construction. Implementation of this measure would ensure that this impact is less than significant.

Level of Significance Prior to Mitigation: Potentially Significant

Mitigation Measure: The following mitigation would be applied to the proposed project.

MM GEO-2 In the event that fossils or fossil bearing deposits are discovered during ground-disturbing activities, excavations within a 50-foot radius of the find shall be temporarily halted or diverted. Ground disturbance work shall cease until a City-approved qualified paleontologist determines whether the resource requires further study. The paleontologist shall document the discovery as needed in accordance with Society of Vertebrate Paleontology standards (Society of Vertebrate Paleontology 1995), evaluate the potential resource, and assess the significance of the find under the criteria set forth in *State CEQA Guidelines* Section 15064.5. The paleontologist shall notify the appropriate agencies to determine procedures that would be followed before construction activities are allowed to resume at the location of the find. If avoidance is not feasible, the paleontologist shall prepare an excavation plan for mitigating the effect of construction activities on the discovery. The excavation plan shall be submitted to the City of Fairfield for review and

[19] University of California Berkeley, University of California Museum of Paleontology Specimens. Website: https://ucmp.berkeley.edu/collections/databases/ (accessed April 6, 2022).

[20] United States Geological Survey, California Geologic Map Data. Website: https://mrdata.usgs.gov/geology/state/state.php?state=CA (accessed April 6, 2022).

approval prior to implementation, and all construction activity shall adhere to the recommendations in the excavation plan.

Level of Significance after Mitigation: Less than Significant

4.6.5.7 Cumulative Impacts

Cumulative Impact C-GEO-1: The construction and operation of the proposed project, in conjunction with other past, present, and reasonably foreseeable future development in the project area, would not result in significant cumulative impacts related to geology and soils.

The proposed project would not contribute considerably to any cumulative impacts related to geology and soils. Development of the proposed project in conjunction with other past, present, and reasonably foreseeable future development would increase the number of individuals that could be exposed to regional seismic risks in the seismically active Bay Area. However, this cumulative risk would be reduced to a less-than-significant level through the implementation of the requirements of the CBC, *City of Fairfield General Plan* Health and Safety Element policies, and the implementation of **Mitigation Measure GEO-1**, which includes the incorporation of the recommendations of the Geotechnical Study into project design and construction. New structures could be built on areas susceptible to liquefaction or expansive and/or unstable soils. However, these impacts are confined to the specific development site (i.e., they would not contribute to any cumulative impacts) and are not expected to be significant once standard geotechnical mitigation measures have been implemented. When the City considers future development proposals, these proposals would undergo environmental review pursuant to CEQA and, when necessary, mitigation measures would be adopted as appropriate. In most cases, this environmental review and compliance with the CBC, project conditions of approval and relevant policies of the General Plan would ensure that significant impacts on geology and soils would be avoided or otherwise mitigated to less-than-significant levels.

The proposed project would not be located on or near a known paleontological resource site or a unique geologic feature and would, therefore, not affect such resources. In the event that buried paleontological resources are encountered, **Mitigation Measure GEO-2** will be implemented to reduce the project's impact to a less-than-significant level. Other approved or probable future projects within the City may be located near known paleontological sites or a unique geologic feature, and ground disturbance associated with these projects could result in potentially significant impacts on unidentified paleontological sites or unique geologic resource unearthed during ground disturbance. However, impacts on resources accidentally discovered during implementation of these projects would be mitigated to less-than-significant levels with appropriate mitigation measures adopted as conditions of approval. Collectively, recent past, approved, and probable future projects that may occur in the vicinity—including the proposed project—would not result in a cumulative increase in impacts on paleontological or unique geologic features, as these resources would be avoided or otherwise removed, analyzed, and reported.

When the City considers future development proposals, these proposals would undergo environmental review pursuant to CEQA and, when necessary, mitigation measures would be adopted as appropriate. In most cases, this environmental review and compliance with project

conditions of approval and relevant policies of the General Plan would ensure that significant impacts on paleontological resources and unique geologic features would be avoided or otherwise mitigated to less-than-significant levels.

Level of Significance Prior to Mitigation: Less than Significant

Mitigation Measures: No mitigation measures are required.

Level of Significance after Mitigation: Not Applicable